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IS 4804-4 (1973): Resistance Welding Equipment, Part IV:
Single Phase Stationary, Press Type Roll-spot and Seam
Welding Machines [ETD 21: Electric Welding Equipment]



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Indian Standard

SPECIFICATION FOR
RESISTANCE WELDING EQUIPMENT

PART IV SINGLE PHASE STATIONARY, PRESS TYPE
ROLL-SPOT AND SEAM WELDING MACHINES

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Indian Standard

SPECIFICATION FOR RESISTANCE WELDING EQUIPMENT

PART IV SINGLE PHASE STATIONARY, PRESS TYPE ROLL-SPOT AND SEAM WELDING MACHINES

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Indian Standard

SPECIFICATION FOR RESISTANCE WELDING EQUIPMENT

PART IV SINGLE PHASE STATIONARY, PRESS TYPE ROLL-SPOT AND SEAM WELDING MACHINES

0. FOREWORD

0.1 This Indian Standard (Part IV) was adopted by the Indian Standards Institution on 5 January 1973, after the draft finalized by the Electric Welding Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This part covers ac single-phase stationary, press type roll-spot and seam welding machines and designates the electrical ratings together with the mechanical requirements, such as nominal electrode-force, throat-depths and dimensions of welding wheels. Requirements for method of actuation, cooling and mechanical and electrical features are also specified.

0.3 Though the welding machines covered by this standard are single-phase, a three-phase supply is required for the motor as specified in 3.5.1.

0.4 This standard is not complete in itself and shall be read in conjunction with IS : 4804 (Part I)-1968*.

0.5 In preparing this standard, assistance has been derived from electrical standards for resistance welding equipment, Bulletin 16 (1966). Resistance Welder Manufacturing Association, USA.

0.6 This standard contains clauses which call for agreement between the purchaser and the supplier and which require the manufacturer to supply certain technical information at the time of placing orders. The relevant clauses are 3.1 and 3.5.6.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Specification for resistance welding equipment: Part I Single-phase transformers.

†Rules for rounding off numerical values (revised).

1. SCOPE

1.1 This standard (Part IV) covers the essential electrical and mechanical features pertaining to standard sizes of stationary single-phase ac transformer type seam-welding machines. It does not include electrical and electronic-control equipment.

1.2 This standard does not cover fixture type or special-purpose seam welding machines.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions and those given in IS : 4804 (Part I)-1968* shall apply.

2.1 Seam Welding — A resistance welding process wherein coalescence is produced by the heat obtained from resistance to the flow of electric current through the work-parts held together under pressure by circular electrodes. The resulting weld is a series of overlapping spot welds made progressively along a joint by rotating the electrodes.

2.2 Longitudinal Seam-Welding — Seam-welding in a direction parallel to the throat depth of the welding machine.

2.3 Circumferential Seam-Welding — Seam-welding in a direction at right angles to the throat depth of the welding machine.

2.4 Universal Seam-Welding Machine — A seam-welding machine readily adaptable for circumferential as well as longitudinal seam-welding.

2.5 Circular Electrode (Welding Wheel) — A rotating electrode with a work-contacting surface on the periphery.

2.6 Gear-Drive — A means of driving a circular-electrode of a seam-welding machine in which the driving torque is transmitted to the circular-electrode through a train of gears.

2.7 Friction Drive — A means of driving a circular-electrode of a seam-welding machine in which the driving torque is transmitted to the circular-electrode through a friction roll.

2.8 Universal-Seam-Welding Head — A welding head readily adaptable to both circumferential and longitudinal seam-welding.

2.9 Nominal Electrode Force — The theoretical force (neglecting inertia and friction, etc) transmitted by the electrodes to the components of the work piece.

*Specification for resistance welding equipment: Part I Single-phase transformers.

2.10 Ram — The assembly on press type seam-welding machine through which the operating forces of the operating means are transmitted to the electrode.

2.11 Roll-Spot Welding — A resistance-welding process wherein the welding progresses in a substantially linear manner by a series of spaced spot weld (usually accomplished by the use of circular electrodes).

2.12 Electrode Skid — During spot or seam-welding, the sliding of an electrode along the surface of the work.

3. DESIGN AND PERFORMANCE

3.1 Methods of Operation — For all machine sizes the circular-electrode shall be motor driven. Motor drive shall have a stepless variable speed ratio of not less than 3 to 1. Electrode drive system can be any one of the following:

- a) Upper gear-drive,
- b) Lower gear-drive,
- c) Upper friction drive,
- d) Lower friction drive, and
- e) Upper and lower friction drive.

NOTE — Where electrode drive system is of (c), (d) or (e) type, the electrode skid shall be a matter of agreement between the purchaser and the supplier.

3.2 Electrode-Control System — The upper electrode shall be mounted on a ram operated by means of directly connected double acting cylinder, pneumatically or hydraulically actuated.

3.2.1 Pneumatic Actuation — Pneumatic actuation shall be by means of a directly connected double acting cylinder mounted above the ram, having a connecting piston-rod with adjustment and arranged to apply pressure through a single pressure control.

3.2.2 Air-operated machines shall be provided with a solenoid valve actuated by either a hand- or foot-switch.

3.2.3 Hydraulic Actuation and Control — Operation shall be obtained by means of a directly connected double acting hydraulic cylinder mounted above the ram, having a connecting piston-rod with adjustments and arranged to apply pressure through a single pressure control and will include a self contained motor driven pump and hydraulic system.

3.2.4 Hydraulically-operated machines shall be provided with a solenoid operated valve actuated by either a hand- or foot-switch.

3.3 Electrical Ratings — The preferred ratings in kVA at 50 percent duty cycle shall be 50, 75, 100, 150, 200, 250 and 400.

3.4 Mechanical Features

3.4.1 Nominal Electrode Force — Nominal throat depth, ram-stroke and lower-arm work clearance shall be in accordance with the relevant values given in Table 1.

3.4.2 Electrode dimensions shall be as given in Table 1.

3.5 Accessories

3.5.1 The motor shall be three-phase continuous duty TEFC motor as per IS : 325-1970*.

3.5.2 Motor starters shall conform to IS : 1822-1967†.

3.5.3 Accessories for Pneumatic Actuation — Air-line accessories shall include the following:

- a) Simple air strainer,
- b) Air-line lubricator,
- c) Air (weld) pressure regulating valve,
- d) Air (weld) pressure gauge,
- e) Air pressure switch, and
- f) Air-speed control valves or air cylinder cushion.

3.5.4 Accessories for Hydraulic Operation — Hydraulically-operated machine shall be provided with the following accessories:

- a) Pressure regulating valve, and
- b) Weld pressure gauge.

3.5.5 A weld power 'on-off' switch shall be provided.

NOTE — This switch is a means whereby the machine can be sequenced in the normal manner except that welding current shall not be applied.

3.5.6 Optional Accessories — The following accessories may be provided, if required by the purchaser:

- a) Contactors, timers, heat controls, current compensators or any other device for welding current control or regulation;
- b) Water flow switches;
- c) Air reservoir or tank;
- d) Air line filter; and
- e) Provision for refrigerated cooling.

*Specification for three-phase induction motors (*third revision*).

†Specification for ac motor starters of voltage not exceeding 1 000 volts (*first revision*).

TABLE 1 MECHANICAL STANDARDS FOR SEAM WELDING MACHINES

(Clauses 3.4.1 and 3.4.2)

RATING OF TRANSFORMER kVA AT THE RATE OF 50 PERCENT DUTY CYCLE	NOMINAL* THROAT DEPTH	NOMINAL ELECTRODE FORCE	NOMINAL† RAM STROKE	NOMINAL ELECTRODE SIZE		MINIMUM LOWER ARM WORK‡ CLEARANCE (Dia)	
				Thickness	Dia	Knurl and Gear Driven Electrode	Idling Electrodes
(1)	(2) mm	(3) Newton	(4) mm	(5) mm	(6) mm	(7) mm	(8) mm
50	{ 460 610 760	4 400	100	9·5	178	280	230
75							
100	{ 460 760 1 070	9 800	127	12·5	203	380	280
150							
200							
250	{ 610 920 1 220	13 200	150	18·7	254	457	355
400							

*The nominal throat depth shall be measured from the centre-line of point of welding to the nearest point of the interference for flat work or sheet. In the case of machines with universal upper-heads, the above measurements shall be taken with the machine arranged for circumferential welding.

†Nominal ram strokes shown include vertical adjustments of ram but no vertical adjustments of lower arm.

‡The maximum length of work at the above minimum diameters shall be 150 mm, less than the nominal throat depth. These dimensions do not apply to the universal head type of seam-welding machines.

3.6 Water Cooling — For all sizes of seam-welding machines, water cooling shall be provided for the following parts:

- a) Welding transformer;
- b) Upper stationary secondary conductor;
- c) Upper circular electrode;
- d) Lower secondary conductor;
- e) Welding electrode-bearing shafts; and
- f) External cooling of work or electrodes and the following:
 - 1) A suitable visual drain-manifold shall be provided;
 - 2) A single inlet of suitable size shall be provided;
 - 3) Each cooling circuit shall have a flow adjusting and shut-off valve, mounted in the machine proper; and
 - 4) A suitable device (such as a water flow switch for protection against water failure and consequential effects like over-heating).

3.7 Electrical Features

3.7.1 Voltage adjustment shall be obtained through a plug or link arrangement or tap-change switch of not less than 8 steps, providing a minimum open circuit secondary voltage which shall be 55 to 65 percent of the maximum open circuit voltage. Standard input voltage shall be 415 volts 50 Hz.

3.7.2 Initiating Control — The nominal voltage on any initiating switch shall not exceed 110 volts.

3.7.3 Test for Rating Maximum Conventional Power at the Rate of 50 Percent Duty Cycle — The secondary circuit of the transformer shall be short circuited in the manner described in 3.7.4. The temperature-rise test shall then be carried out in accordance with the method described in 7.6 of IS: 4804 (Part I)-1968*.

3.7.4 Short-Circuit Condition — For the purpose of this standard short circuit shall consist of bringing the electrodes together under maximum pressure and flooding the electrode contact area with water, if the currents used during the test are high enough to damage the electrodes without such flooding. The electrodes shall be of the standard maximum sizes and may be either held stationary or rotated during test.

3.7.5 Short-Circuit Secondary Current

3.7.5.1 The short-circuit secondary current when determined in the relevant manner described in IS: 4804 (Part I)-1968*, with the throat depth as specified in Table 2 shall comply with the minimum values given therein.

*Specification for resistance welding equipment: Part I Single phase transformers.

TABLE 2 THROAT DEPTH AND MINIMUM SHORT-CIRCUIT CURRENT

(Clause 3.7.5.1)

TRANSFORMER RATING AT 50 PERCENT DUTY CYCLE	THROAT DEPTH mm	SHORT-CIRCUIT CURRENT MINIMUM VALUE AMPERES
50	460	16 200
	610	15 300
	760	14 500
75	460	19 600
	610	17 900
	760	17 900
100	460	23 500
	760	22 100
	1 070	18 700
150	460	28 900
	760	25 500
	1 070	23 800
200	460	32 300
	760	28 000
	1 070	25 500
250	610	32 300
	920	28 000
	1 220	25 500
400	610	38 300
	920	34 000
	1 220	32 300

3.7.5.2 The transformer shall be capable of operating at not less than 20 percent duty-cycle at the indicated short circuit current without exceeding the temperature-rise specified in IS : 4804(Part I)-1968*.

NOTE — For the purpose of compliance with this clause, it shall suffice to compute the duty-cycle in accordance with the formula given in 4.3.1 of IS : 4804 (Part I)-1968*, px being taken as the product of minimum value of short-circuit current in kA and the maximum open circuit secondary voltage.

4. MARKING

4.1 The following information shall be legibly and indelibly marked on the name-plate:

- The name of the manufacturer and/or trade-mark;
- Manufacturer's type and serial number;

*Specification for resistance welding equipment : Part I Single phase transformers.

IS : 4804 (Part IV) - 1973

- c) Reference to this standard, that is, Ref IS : 4804 (Part IV) - 1973;
- d) Maximum conventional power in kVA at 50 percent duty-cycle;
- e) Maximum short-circuit power, P_m in kVA;
- f) Maximum short-circuit secondary current in amperes;
- g) Supply voltage and frequency;
- h) Maximum and minimum open circuit secondary volts;
- j) Class of insulation;
- k) Cooling water l/min per circuit by number of circuits;
- m) Water pressure range in kgf/cm^2 range;
- n) Maximum electrode force in kgf ;
- p) Air pressure range in kgf/cm^2 range;
- q) Maximum throat depth;
- r) Maximum temperature of input-cooling water;
- s) Welding electrode speed range;
- t) Weight of the equipment; and
- u) Country of manufacture.

4.1.1 The welding machines may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.